

App. No. 10/070,288
Office Action Dated January 20, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions and listing of claims in the application.

Claims 1 and 16 are amended.

Listing of Claims:

1. (Currently Amended) An optical semiconductor device comprising:
a laser element;
an emitted beam dividing portion for dividing an emitted light beam from the laser element into a main beam and two sub beams;
a reflected beam dividing portion for dividing a reflected light beam from an information recording medium into light beams in different focused states, the reflected light beam being divided in a direction lateral to the direction in which the emitted beam is divided with the emitted beam dividing portion;
servo-signal-detecting photodetector elements for receiving the reflected light beams obtained by the division by the reflected beam dividing portion in a defocused state so as to detect a servo signal using a three-beam method; and
a signal-detecting photodetector element for receiving a reflected light beam obtained by diffracting with the emitted beam dividing portion a reflected light beam that has passed through the reflected beam dividing portion,
wherein the emitted beam dividing portion includes a first diffraction grating region for generating the main beam, and second and third diffraction grating regions for generating the sub beams, and
the signal-detecting photodetector element receives a beam that is obtained by diffracting the reflected light beam of the main beam with the reflected beam dividing portion and then diffracting an obtained zero order diffracted beam with the first diffraction grating region.
2. (Previously Presented) The optical semiconductor device according to claim 1, wherein the first diffraction grating region is positioned between the second and third diffraction grating

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regions, and the second and third diffraction grating regions have the same grating arrangement direction which is different from a grating arrangement direction of the first diffraction grating region.

3. (Previously Presented) The optical semiconductor device according to claim 1, wherein two diffracted light beams of the same order diffraction by the first diffraction grating region are subjected to the diffraction with different diffraction efficiencies, and the diffracted light beam having the higher diffraction efficiency is received by the signal-detecting photodetector element.

4. (Previously Presented) The optical semiconductor device according to claim 3, wherein each grating in the first diffraction grating region is of an inclined type having a step-like cross-section shape or a triangular cross-sectional shape.

5. (Previously Presented) The optical semiconductor device according to claim 1, wherein the first diffraction grating region is composed of gratings, each of which is in a curved line form.

6. (Previously Presented) The optical semiconductor device according to claim 1, wherein the first diffraction grating region is composed of a plurality of diffraction grating regions having the same diffraction efficiency.

7. (Previously Presented) The optical semiconductor device according to claim 1, wherein the first diffraction grating region is composed of at least two diffraction grating regions that differ from each other in a direction in which gratings are arranged.

8. (Previously Presented) The optical semiconductor device according to claim 1, wherein the first diffraction grating region is composed of diffraction grating regions having the same grating periodic interval.

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9. (Previously Presented) The optical semiconductor device according to claim 1, wherein the first diffraction grating region is composed of a plurality of diffraction grating regions that divide a spot of the reflected light beam equally.

10. (Canceled)

11. (Previously Presented) The optical semiconductor device according to claim 1, wherein: when the emitted beam dividing portion is positioned on an optical axis extending between an emission point of the laser element and a main spot formed via an objective lens on the information recording medium, the reflected light beam from the foregoing information recording medium entering a region defined by a radius r satisfying a formula shown below is divided so as to be collected on the signal-detecting photodetector element:

$$r \leq d \times \tan(\sin^{-1}(NA))$$

where:

d represents an air-equivalent distance from the emission point of the laser element to the emitted beam dividing portion;

NA represents a numerical aperture of the objective lens; and

r represents a distance from a center located at a point at which the optical axis and the emitted beam dividing portion cross each other on the emitted beam dividing portion.

12-15. (Canceled).

16. (Currently Amended) An optical information processing device comprising:

a laser element;

an emitted beam dividing portion for dividing an emitted light beam from the laser element into a main beam and two sub beams;

an optical system for guiding the light beams obtained by the division by the emitted beam dividing portion to an information recording medium;

a reflected beam dividing portion for dividing a reflected light beam from the information recording medium into light beams in different focused states, the reflected light beam being

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divided in a direction lateral to the direction in which the emitted beam is divided with the emitted beam dividing portion;

servo-signal-detecting photodetector elements for receiving the light beams obtained by the division by the reflected beam dividing portion in a defocused state so as to detect a servo signal using a three-beam method; and

a signal-detecting photodetector element for receiving a light beam obtained by diffracting with the emitted beam dividing portion the reflected light beam that has passed through the reflected beam dividing portion,

wherein the emitted beam dividing portion includes a first diffraction grating region for generating the main beam, and second and third diffraction grating regions for generating the sub beams, and

the signal-detecting photodetector element receives a beam that is obtained by diffracting the reflected light beam of the main beam with the reflected beam dividing portion and then diffracting an obtained zero order diffracted beam with the first diffraction grating region.

17. (Previously Presented) The optical semiconductor device according to claim 1, wherein the signal-detecting photodetector element has a light-receiving area smaller than a light-receiving area of the servo-signal-detecting photodetector elements.

18. (Original) The optical semiconductor device according to claim 1, wherein:

a pair of the servo-signal-detecting photodetector elements are arranged symmetrically with respect to an optical axis; and

the signal-detecting photodetector element is arranged at a shorter distance from the optical axis than the servo-signal-detecting photodetector elements and has a light-receiving area smaller than a light-receiving area of the servo-signal-detecting photodetector elements,

wherein the pair of the servo-signal-detecting photodetector elements and the signal-detecting photodetector element are integrated.

19. (Original) The optical semiconductor device according to claim 18, wherein the signal-detecting photodetector element is positioned closer to one of the servo-signal-detecting photodetector elements.

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20. (Previously Presented) The optical semiconductor device according to claim 18, wherein the signal-detecting photodetector element is provided in substantially a same plane as an emission point of the laser element.

21. (Original) The optical semiconductor device according to claim 18, wherein the signal-detecting photodetector element is divided into a plurality of detecting sections having substantially equal areas.

22. (Withdrawn) An optical element comprising:

a first optical element that is provided on one surface of a transparent member and that includes first, second and third diffraction gratings; and

a second optical element that is provided on the other surface of the transparent member and that includes a diffraction grating,

wherein the first diffraction grating is positioned between the second and third diffraction grating, and the second and third diffraction gratings have the same grating arrangement direction which is different from a grating arrangement direction of the first diffraction grating.

23. (Withdrawn) The optical element according to claim 22, wherein the first diffraction grating is composed of a plurality of diffraction grating regions that differ from each other in a grating arrangement direction.